"WRITTEN SO YOU CAN UNDERSTAND IT."

POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

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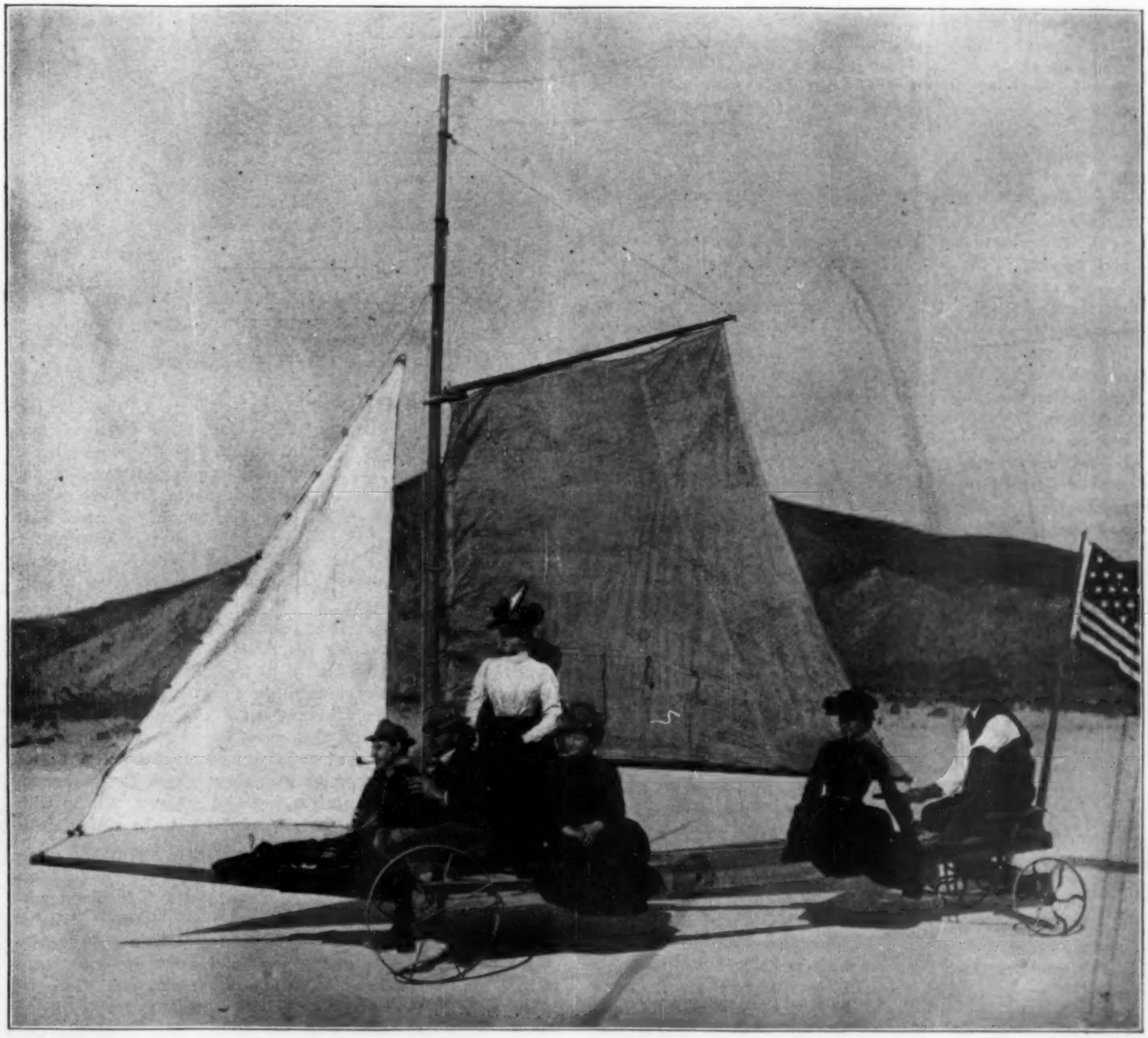
QUEEREST SHIP THAT EVER SAILED

Strange Craft that Skims the Lifeless Sands of the Dreaded Majava Desert



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THE DESERT QUEEN

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THE FIRST REAL SHIP OF THE DESERT.

Strange Craft That Terrified Natives May Do Away With the Camel in Saharah.

It remained for America to construct a real "ship of the desert." It is doubtless destined to work an innovation in the methods of transportation across the great Saharah. The device illustrated on the front page is used for traffic on the once dreaded desert of Majava in Southern Salifornia. It is called the "Desert Queen" and is the first sailing vessel for service on the land ever built. It makes a speed of from 50 to 80 miles an hour and has obliterated all the perils and horrors formerly attended with the crossing of this solitudinous waste. A whole fleet of such craft will probably be put in operation on this desert and the one in New Mexico. With their aid traffic across the lifeless plains will be made pleasant, sure and speedy. Faster than the fastest train the Desert Queen glides ghostlike over the hard sands, reminding one of traveling in an air ship. The sailing trucks may result in populating those weird parts of the earth that have hitherto been regarded uninhabitable. They may be constructed at small cost and are easily operated.

This "mechanical dromedary," the strangest vehicle ever propelled by the wind, was built by two miners, Charles S. and Carl L. Hoyt, of Cleveland, O., just six months ago. It has been in use ever since, covering thousands of miles. The Hoyts have a gold mine in the buttes near Rosamond, Cal. They live nine miles away at the other end of a peculiar dry lake, which is hard as concrete and swept smooth as a tennis court by the sands forever driven over it by the fierce winds rushing through Tehachepi pass.

The device is a stanch boat 14 feet long, 8 feet across in front and tapering to the rear with a mast 15 feet high; mainsail 10 feet on the boom and 10 feet on the mast; jib and jibboom to match. For the front support an axle, like that of a buggy, was used, and to this were attached two iron wheels, each 30 inches in diameter. The rear wheels are also of iron and 24 inches in diameter. The steering contrivance is like that used on a hook and ladder truck. The "ship" answers its helm perfectly and sails about as close to the wind as the ordinary water craft. But one accident has happened to the boat. That was on its trial trip when it got beyond control. It tore along at a terrific rate and was dashed to pieces against a sandbank. Several of the passengers were slightly injured. The vehicle had to be rebuilt and since has been subject to perfect control. It carries its owners and their supplies and tools to and from the mine every day, and on the holidays and moonlight nights is used for conveying excursion parties.

This boat with its rough iron wheels and otherwise crude construction has suggested various possibilities of desert traffic, with a similar contrivance of ball bearings and rubber tires and plenty of canvass. Such a machine, it is believed, would travel across the deserts of thick sands as successfully as does this one over the hard bottom of the dry lake.

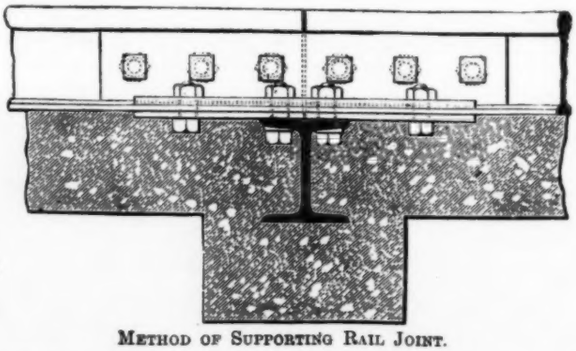
Those who have ridden on the Desert Queen claim it to be the most exciting of experiences. As it goes bounding along horned toads scurry away over the hot sands; lizzards, like blue streaks, dart for shelter; little ash-colored desert chipmunks scatter the sands about in their frenzied haste to get into their retreats; an occasional coyote, long and gray—the picture of starved want—rises upon his scraggy hind legs and sniffs; now and then the wheels pass over a deadly rattlesnake; it speeds by the bleaching bones of some poor creature, human or otherwise, that has suffered the horrors of starvation.

The moonlight excursions on the "Queen" are said to be the rarest of sports. There is something uncanny about the singular craft, shooting noiselessly through the moonlight, like a white-sheeted specter. When it was first put in service, stray travelers who met it were frightened almost out of their wits. The Piute Indians were panic stricken. With wild whoops of alarm they made a rush to get away, the braves trampling the squaws and pappooses under foot. Their food was thrown away, and when the strange white monster had gone the terror-stricken natives prayed throughout the night.

ENGLISH METHOD OF SUPPORTING RAILS.

Railroad construction and operation in England is very different from that in this country. Their tracks are laid with a view to greater permanenny, and to walk on a steam railroad is trespassing for which the offender is arrested and fined.

Their street railway tracks are laid in cement instead of upon wooden ties. Our cut, from the Electrical Review, London,



METHOD OF SUPPORTING RAIL JOINT.

shows their manner of supporting rail joints. Not only are the ends of both rails firmly bolted together, but the point of junction is supported by an I beam laid crossways and firmly imbedded in the cement.

ONE MAN CAN MAKE A MILLION PINS A DAY.

Wonders Improved Machinery Has Accomplished for America Described By a Frenchman.

The pin trade is mentioned by M. Levasseur, a French writer, as an instance to illustrate the wonders that improved machinery has accomplished for America. "Along with improved machinery," he says, " has come an enormously increased output with less labor. When Adam Smith wrote his book, which forms the foundation of modern economics, he showed that with machinery then existing one man could make 4,800 pins a day. Today one man makes a million and a half pins. A pound of pins then cost a guinea (4.66) for manufacture; now it costs about a shilling (23 cents).

M. Levasseur spent a long time in the industrial centers of the United States studying the American workingman. "The industrial success of the United States," he declares, "is owing largely to the ingenuity, inventiveness and industry of the mechanic. The American workman is the man with the machine. Nothing is done by hand that machinery can do instead, and the automatic apparatus of today is ousted by a better of tomorrow. Machinery dispenses with about 70 per cent of human labor in shoemaking, as against the old machines. A man with the modern plant finishes 300 pair of shoes in the same time it would have required to finish five by hand.

The center of population of the United States is 6 miles southeast of Columbus, Ind. In 1800 it was 18 miles west of Baltimore, Md. The center of population is the center of gravity of the population of a country, each individual being assumed to have the same weight. What is known as the meridian point is the point of intersection of the line dividing the population equally north and south with the line dividing it equally east and west. In computing the former, distance from the center is taken into account while in the latter it is not.

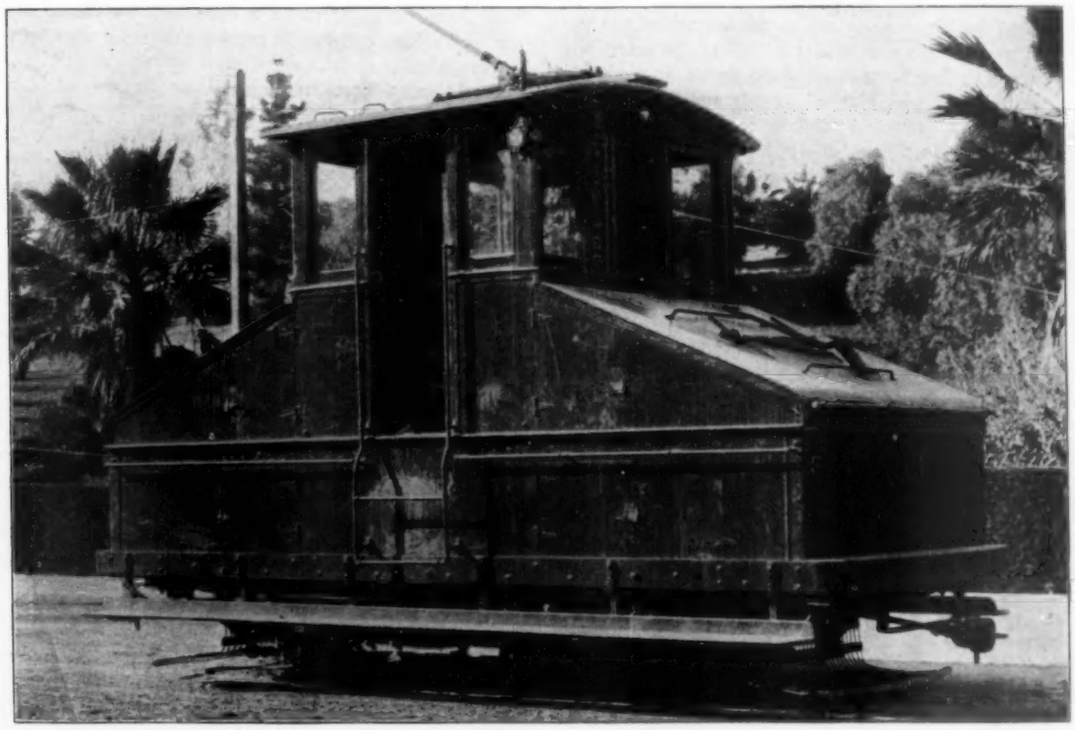
The center of area of the United States is in Northern Kansas.

ELECTRIC LOCOMOTIVE.

This curious looking trolley car is in use at Los Angeles, Cal., and is fully described in the Street Railway Review for February. The car is sent out whenever there is any accident to the overhead wires or other cars. It can be operated by one man, and has abundant storage room for all kinds of necessary tools used in making repairs.

A number of doors will be noticed in the side of the cab shown in the illustration and there is a corresponding number on the opposite side. These are for different compartments which are used to store away wrecking materials such as frogs, wedges, jacks, crow bars, chains, block and tackle, blocking, etc. There is a large door at each end of the cab which closes two large compartments. Just beneath the floor of the cab a four-wheel dolly is carried to be used in case of broken axles occurring on the road. It is arranged that this dolly can be taken from either end of the cab and run down on skids immediately under the disabled car.

The car is 19 feet long, has 80-horse-power motors, and is provided with air brakes.



ELECTRIC WRECKING CAR—LOS ANGELES.

FROST PROOF AND AIR TIGHT DWELLINGS.

Heating contractors may benefit from the instructions of J. D. Morrison of Reinbeck, Ia., in Domestic Engineering:

In dwellings of the better class all walls should be made with at least one, or better with two, absolute dead air spaces, and the openings should be made as nearly air tight and frost proof as possible. All sash should be made solid and double-glazed with air spaces between and all doors should close against rubber stops and open into halls or vestibules also provided with air tight doors.

Ventilation should be accomplished by the aid of a blower operated by water motor or other power and a system of pipes to carry the air to every part of the building. In cold weather the air should be warmed by passing it over a steam coil and in warm weather it could be cooled by passing it over the same coil filled with cold water. The house may be heated with either hot water or steam with very little fuel because the style of construction has stopped the leaks common to many houses. The walls, windows, doors and roof of a house should be as nearly as possible non-conductors of heat and absolutely air tight. Ventilation should be mechanical, automatic and positive instead of spasmodic and uncertain.

FORCES HENS TO PART WITH THEIR EGGS.

Valuable Secret Possessed by a Bayport, L. I., School Commissioner.

Commissioner H. M. Packer of the Bayport, L. I., schools, is said to have discovered the secret of how to compel hens to lay eggs. His profits are so great as a result of the discovery, however, that this Napoleon of the hen-yard refuses to make known the process by which he forces his 24 Leghorn hens to part with eggs every day, no matter how unfavorable the month. During the three "slow" months of October Mr. Packer got 42 dozen eggs from his 24 Leghorns; in January he got 30½ dozen. People are pleading with the Egg King to open a school and impart his secret to others. They claim that if he does not, the next fad with the smart set will be egg jewelry—brooches, rings and such trinkets—set with real eggs and to be had only at Tiffany's.

There are 15,333,000 more males on earth than females. Europe with a total population of 334,000,000 has a female excess of 3,750,000. In America the excess of males is more than a million in a povulation of 102,000,000.

Horse and donkey meat has been legally sold in Vienna since 1854. There are 185 butcher shops engaged in the business. Prices range from 5 to 11 cents per pound. About 26,000 horses and 100 donkeys are slaughtered annually.

The smallest library in the world, in the size of its books, is owned by an Italian mining engineer, named Solomini. It is made up of Dutch 'Liliput" editions, 1,500 volumes, which were printed in the 17th and 18th centuries. The smallest book in the collection is of 160 pages. It is about an inch square and a little more than a tenth of an inch thick.

Easy Electrical Experiments

FOR BOYS.

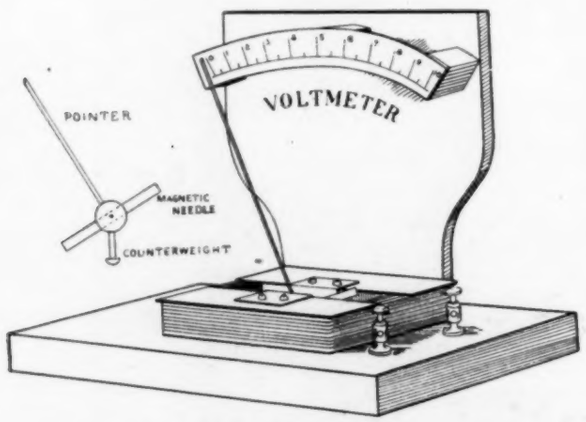
CHAPTER IX.

THE CONSTRUCTION AND USE OF A VOLTMETER.

By L. P. Dickinson.

In the preceding chapter three electrical units were explained. One of these, the volt, is the standard by which we measure electrical pressures. An instrument designed to measure electromotive force (electrical pressure) is called a voltmeter. There are several ways of constructing such an instrument, but nearly all depend for their action upon the mutual effects produced between a magnetic needle and a coil of insulated wire carrying a current. The instrument now to be studied is a simple one, yet it is one which may be easily constructed by an amateur with profit to himself in the knowledge thereby gained.

A base board should first be secured 5 inches long, 2½ inches wide and ½ inch thick. In its center cut a slot ⅜ inches wide and 1½ inches long, with the slot running lengthwise of the board. At each side of the slot glue two blocks, each 1½ inches



long, ½ inch high and ¼ inch in thickness, the blocks being even with the sides of the slot. Around these, as a support, is to be wound in a horizontal coil 225 ft. of No. 32 double silk-covered magnet wire. The length and size of this wire are both very This sewing needle should be ½ inch long and with very sharp a strong magnet. If the spring has not been softened at the pointer into the position shown in the figure.

A magnetic needle is next to be made, whose position is to be inside of the coil. The best material of which to make this needle is a piece of watch spring, such as may be obtained for the asking at an obliging watch repairer's shop. Select a piece 1⅜ inches long and ⅛ inch wide. Straighten it by bending it with the fingers. Heat the center of it in a small alcohol flame, taking care to keep the ends cool by holding wet cloths upon them. Then bore a small hole through the center big enough to allow an ordinary sewing needle to pass through. This sewing needle should be ½ inch long and with very sharp points at each end. It may be made by breaking off an ordinary needle until it is of the proper length, and then grinding the ends to a sharp point. Insert the needle through the hole in the piece of watch spring, and fasten the latter in the center of the needle by two small pieces of wood, circular in shape, which slip tightly on to the needle, and clamp the piece of watch spring tightly. A little glue will help make everything firm. Then magnetize the piece of watch spring by rubbing it with a strong magnet. If the spring has not been softened at the ends it will keep its magnetism to a large degree.

To the magnetic needle thus mounted a pointer 3 inches long is to be attached, at right angles to the needle. The best material of which to make this pointer is a firm, hard straw, taken from an ordinary broom. Straighten it by rubbing between the fingers, bore a very small hole in one of the wooden clamps, which hold the piece of watch spring to the piece of needle, insert the pointer in this hole, and fasten with a bit of glue. The pointer should be straight and should be at right angles to the piece of watch spring. Take a small brass screw and screw it into one of the pieces of wood which hold the watch spring in place, in such a position that the pointer, magnetic needle and screw (counterweight) will have the relation shown in the figure. The purpose of this screw is to bring the pivoted needle and its pointer back a certain position whenever the pointer is moved.

To mount the needle, take two pieces of thin sheet brass, each 1 inch long and ½ inch wide. In the middle of each and ¼ inch from each end make a deep dent by means of a pointed nail and a hammer, but be careful not to punch a hole completely through the metal. Bend each strip over at right angles in the middle. These strips can now be slipped down in the slot in the middle of the coil first made, and by a little patience the piece of sharp pointed sewing needle, with its pointer, magnetic needle and counterweight will just slip down into the dents punched in the sheet iron and swing freely there. It may be necessary to do a little filing and bending, but the needle and its supports can finally be adjusted so that it swings very freely and easily in its place. The counterweight (screw) should be heavy enough and in the right position to bring the pointer into the position shown in the figure.

At the back of the board fasten an upright piece of thin wood, of the shape shown, and 4 inches wide at the top. To this, at the proper height, attach a piece of thick cardboard, circular in shape. It should be supported by blocks in such a position that the pointer will move close to it, but not touching it.

Be sure that the parts of the moving system have the relation shown in the figure, and that the needle swings very freely.

Our instrument is now complete, except for the matter of marking the scale. We shall have to leave this until a later chapter, however, when, in addition to completing our instrument, we shall learn something regarding its use.

THE PRESIDENT A SLAVE TO CUSTOM.

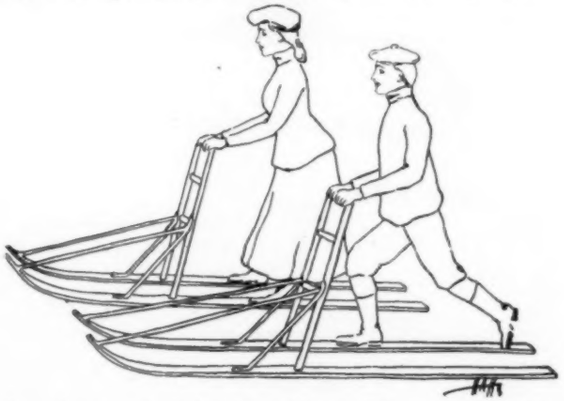
No citizen of the United States enjoys so few liberties as the President. The average subject of Uncle Sam would groan with indignation if subjected to as many restrictions as is the nation's head. He is the only law-abiding and reason-possessing citizen of the United States whom custom holds a prisoner within limited bounds. The Ladies' Home Journal, in an article on "Some Things the President Does Not Do," shows that the nation's chief executive is more restricted than the janitor who daily empties his waste basket. For he must not leave the country open for a day. Neither can he go aboard a foreign warship, even when anchored in our own harbor and when flying the colors of a friendly state. He dare not make a formal call on any one except the president-elect, an ex-president, a president of a foreign state or a reigning monarch visiting our Capital. He must not receive any but intimate friends on Sunday. He must not occupy other than the seat of honor at any formal dinner. He must never occupy the left side of a seat of a carriage. He can't enter foreign embassies' residences in Washington, for that is foreign ground. These are only a few of the many things the President must not do.

A London firm of solicitors has received a letter in which the sender, described as an English peer of old title, "wishes to marry a wealthy American lady, age and looks immaterial, but character irreproachable," and in exchange for the rank he is to be paid $100,000 in cash.

HOW TO MAKE A RUNNING SLEIGH.

Means of Fine Sport That Is Easily Made and Operated.

The "running sleigh" affords a sport which is now all the rage in Sweden. It is a late invention, simple of construction and easily manipulated. A light sleigh is equipped with long double runners and is propelled by foot power. The person using the sleigh stands with one foot upon a rest attached to one of the braces connecting the runners and propells the sleigh by pushing backward with the other foot. To steady the body an upright support is attached to the runners. The contrivance can be used upon hard frozen ground, thin ice and snow cov-



ered surfaces, and, under favorable conditions, moves with remarkable speed.

The device has a decided advantage over the "Skiis" because the two foot supports are braced so that they cannot come apart. "Skiis" are long thin strips of hard wood jointed and turned up at the forward end. They are attached to the feet separately. In descending a hill they often slide apart or come together abruptly in such a manner as to threaten serious danger. The "running sleigh" is especially adapted for coasting but may also be easily propelled along level ground.

PIGEONS THAT CARRY STOCK QUOTATIONS.

Private Aerial Telegraph Line Between Wall Street and the Cordova Home.

Pigeons have taken the place of messenger boys in service between Wall street and the home of Alfred D. Cordova, on Chetolah farm, out on Long Island. "I think more of the messenger with two wings than the one with two feet," said Mr. Cordova. "The former doesn't smoke cigarettes; it doesn't have to stop at every corner to 'get a light;' it doesn't read 'Dare Devil Dick' and so doesn't fall asleep on an elevated train and have to make two trips instead of one. Bear, Bull, Tape and Ticker are the names of four of Mr. Cordova's pride pigeons. The pigeon, on returning from a journey, enters a small trap, which mechanically rings a bell, that announes its arrival. Mr. Cordova has trained one of the birds to travel between his home and a wild resort in the Indian Territory, where he goes hunting every year. He was awakened in his camp late one night by the ringing of the trap bell, and found a message attached to the pigeon that saved him several thousand dollars. One of the pigeons met a tragic death. He was sent to a drug store for a small vial of medicine. Long the Cordovas waited, when finally the feeble ringing of the bell was heard. The pigeon brought the medicine, but it had been shot on the way and was bleeding to death.

The highest ocean wave ever measured was 40 feet. It was at Petersburg, Eng., when the wind was blowing from 50 to 90 miles an hour. Largest waves in the Indian ocean average 29.63 feet in height. The highest on record there were 37.53 feet.

THE OLDER THE BOAT THE BETTER.

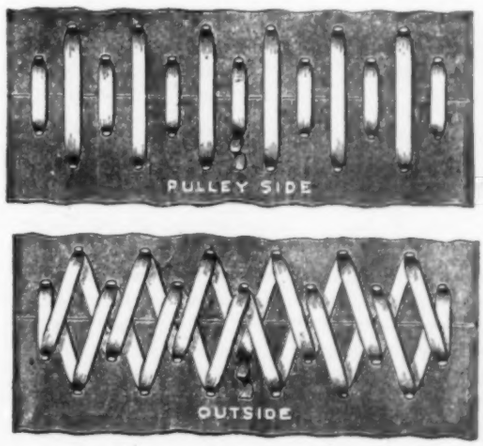
Ancient Steamers That Have Defied the Ravages of Time.

An old river man has said that the older a boat is the better she is, if she be properly cared for. "This statement seems to be true," said Mr. H. L. Joyce, in a paper before the New York Railroad Club, "when you see some of the boats that are working daily in our harbor. The barge Republic, built in 1831, seventy years ago, is still in first-class condition and carrying hay regularly between Albany and New York; the John Neilson, built in 1849, fifty-two years ago, and back in the fifties running as a steamer between South Amboy and New York on the Camden and Amboy line, has since been changed to a barge and can be seen daily in our harbor; the steamers Mary Powell and J. W. Baldwin were built in 1861, forty years ago, and still are favorites; the Norwich, built in 1836, sixty-five years ago, continues to make her regular trips up the Hudson; four of the old style of side wheel towboats used in the harbor before tug propellers came in vogue are still towing and working and their names are familiar ones to all those who daily cross the river, yet they are each over forty-five years old—I allude to the little side wheel boats John E. Moore, J. G. Emmons, Rose and William Fletcher."

GOOD WAY TO LACE BELTS.

The following is considered the best method of lacing belting, by the Peerless Rubber Mfg. Co.:

The belt to be adjusted to the pulleys (depending on the



thickness of the belt) should be cut shorter than the distance around the pulleys by 3-16 to ¼ of an inch for every foot in length, when measured with a metallic tape or wire drawn tightly around the pulleys.

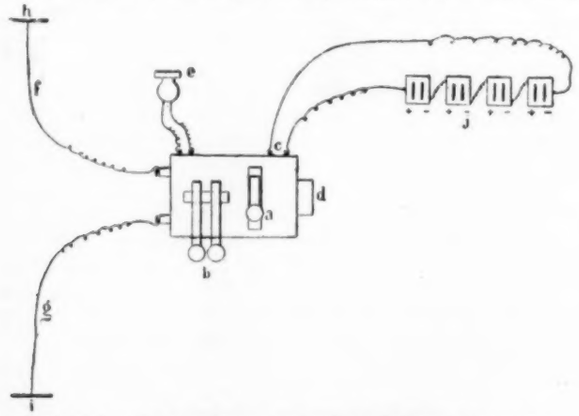
AMERICA THE RICHEST OF ALL NATIONS.

The London Daily Mail year book for 1902 shows the United States to be the wealthiest nation on the globe. It heads the list of countries in wealth and also shows the smallest national indebtedness. Here are the figures:

	Indebtedness.	Wealth.	Percentage of Indebtedness to Wealth.
United States	$1,076,270,000	$79,629,500,000	1.4
Germany	3,170,370,000	39,213,240,000	8.1
United Kingdom	3,438,220,000	57,495,220,000	6
Russia	3,462,570,000	31,289,750,000	11.1
France	6,035,930,000	47,190,300,000	12.8

WIRELESS TELEPHONY IN FRANCE.

In January, a French engineer, Louis Maiche, made interesting experiments in telephoning without wires. He used the earth as a medium for the transmission of his electrical currents, and was able to transmit words as well as the letters of the Morse alphabet. At the distance of one mile the telephone worked as plainly as any ordinary telephone; at three miles



a, Manipulator; *b*, Key; *c*, Battery terminals; *d*, Diffuser; *e*, Telephone *f*, *g*, Earth wires; *h*, *i*, Earth plates; *j*, Battery.

was still practical and distinct; while at seven miles words could not be distinguished but the dots of the Morse telegraph alphabet was reliable. The Electrical Review, London, says:

The connections to earth consisted sometimes of two electrodes immersed in water, and sometimes of electrodes embedded in damp earth. The two electrodes at each station were connected by an insulated wire which formed a basis on which was connected, according as required, the receiver or the transmitter.

PAPER MACHINES IN FORMOSA.

Crude Methods of Manufacturing by the Natives.

There is an opening in Formosa for American manufacturers of paper-making machines, according to James W. Davidson, the American consul at Tamusi. There paper is made entirely by hand and is manufactured from a small bamboo. In describing the making of the paper, Mr. Davidson said:

"The stalks of the young bamboo are crushed with a wooden hammer, then placed in a cemented tank. Water to cover and lime are added, and the material is thus left to decompose for forty-five days. After being washed in fresh water it is placed in a second pit to soak for another forty-five days. The fibrous matter is placed in a stone mortar and crushed to a pulp. It is next placed on a platform and trodden by foot until the water has been driven out. The pulp is moved to a third vat of clean water and stirred."

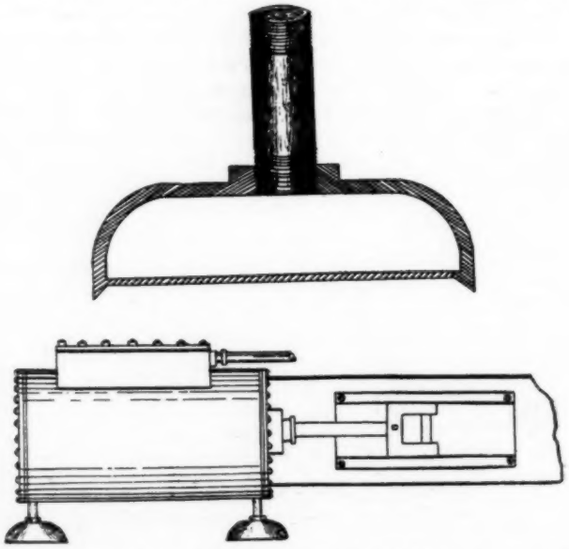
This prepares the substance for the final operation, which consists in submerging a bamboo and wire screen into the contents of the vat, drawing it out and allowing the water to pass off, after which the pulpy sheet is taken from the screen, submitted to a press and hung out in the sun to dry.

Miss Mildred Deuel of Richmond, Va., in the space of ten minutes was a maid, a wife and a widow. Her soldier fiance returned from the Philippines ill with fever. They were married in a San Francisco hospital and the ceremony had hardly concluded when he was dead.

The largest viaduct in the world is over the Gogteik gorge in Upper Burma, 80 miles from Mandalay. It is 2,260 feet long and 325 feet high. It was designed and built in 1900 by American engineers for the English railway in Burma.

TO SAVE CYLINDER HEADS.

A device to prevent the blowing out of cylinder heads is suggested by a writer in the Practical Engineer. The cut illustrates this very simple and extremely cheap device which can be attached to almost any engine cylinder with little trouble and at



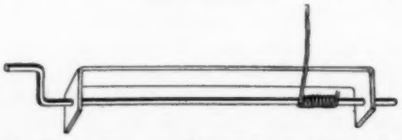
small expense. It is simply a "bursting relief" attached to both ends of the cylinder.

The idea is that a cup be cast and then turned up to such a thinness that any unusual or sudden concussion will force the bottom out of it instead of forcing the head out of the cylinder. A little study will easily teach the engineer just how thick to have the cup bottom, and as they are very inexpensive one can afford to have several on hand for replacing bursted ones.

SIMPLE DEVICE FOR MAKING COIL SPRINGS.

A contributor to the American Artisan tells of a simple device for making coil springs:

"Take a piece of band iron about 12 inches long, 1 inch wide



and ⅛ inch thick, turn up the ends as shown in the sketch, bore holes for the crank and bore holes in the end of the crank to receive the end of the spring wire. It can be fastened to the bench with screws or held firm in the vise."

There are three kinds of thermometers in general use—the Fahrenheit, Reaumur and Centrigrade. The freezing and boiling point on their scales compare as follows:

Thermometer.	Freezing Point.	Boiling Point.
Fahrenheit	32 degrees	212 degrees
Reamur	Zero	80 degrees
Centrigrade	Zero	100 degrees

Casey—"Av course, O'im an Irish-American, an' why not? Don't Oi live in America?"

Cassidy—"O, yes, Oi suppose it's all right."

Casey—"Av course it is."

Cassidy—"Ay; but 'tis lucky for ye that ye don't live in England. Ye'd be an Irish-Englishman then, wouldn't ye?"—Philadelphia Press.

Nearly 200 people out of every 100,000 in the United States die of consumption.

BUILD YOUR CHIMNEYS HIGHER THAN ADJACENT CONSTRUCTIONS.

Ignoranec of the Effect of Air Currents Causes Worlds of Trouble With Flues.

Few people realize how important a part the construction of a chimney plays in the installation of a heating apparatus in a house. In placing a boiler it should be remembered that the taller the chimney the stronger the draft, and it must be ascertained that the area of the chimney flue is proportionate to the area of the grate in the boiler.

The chimney should be as straight as possible. Round or oval is the best form. The square flue is more effective than the rectangular one, because of the smaller amount of friction. A flue 12 by 12, having an area of 144 square inches, has a perimeter (area of unrestricted surface) of only 48 inches;

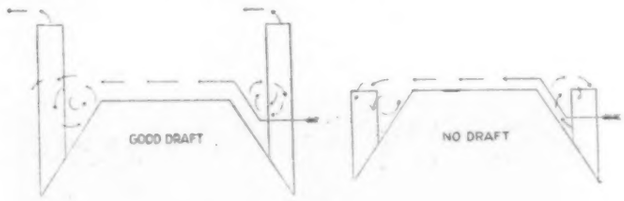


FIG. 1.

while a flue 8 by 18, having an area of 144 square inches, has a perimeter of 52 inches, giving 4 inches additional usable surface. For the requirements of an ordinary heating apparatus, the flue should not be less than 8 by 12, or 96 square inches.

The pipe entering the chimney should go through the thickness of the brick, but no further. Use only one elbow if possible, as every turn in the pipe injures the draft.

Ignorance as to the effect of near-by tall buildings, trees, spires, etc., on the draft often cause defective flues. The American Radiator Company has issued instruction especially warning people against these common errors. When the top of the chimney is lower than the main part of the house or the comb of the roof, the wind from the higher elevations falls like water over a dam, beating down the smoke. A tall tree or an adjacent building higher than the chimney may be so near that the wind passing over it will beat back the smoke in a similar manner.

Frequently a chimney may be found which, having a flue of, say 8 by 12, or 96 square inches, is surmounted by an ornamental capstone, through which are cut two openings, say 6 by 5, or 60 square inches. The builder has thus unwittingly reduced the area of the chimney 37½ per cent. It is the same,

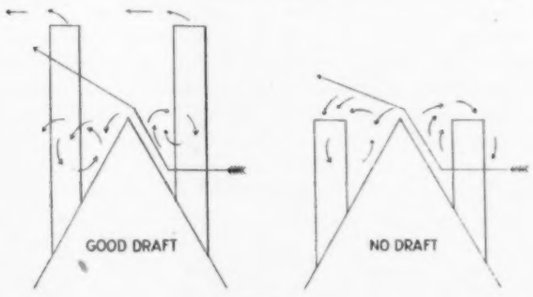


FIG. 2.

said an official of the American Radiator Company, as for a person to attempt to breathe through a piece of paper perforated by several pin pricks.

In adding a smoke stack or patent cap to the top of a chimney, care should be taken to see that such addition does not decrease the area of the flue. The effectiveness of a flue is only as great as its smallest area.

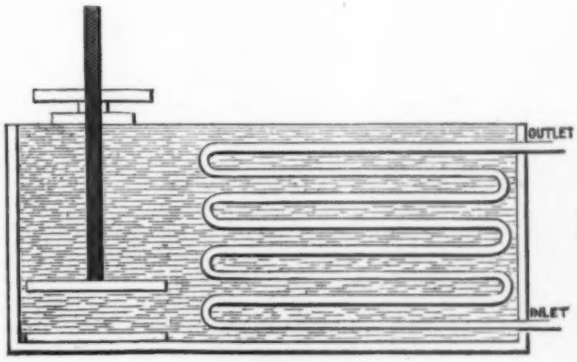
Figs. 1 and 2 show examples of good and bad draft, the arrows indicating the air currents. Fig. 3 also shows movement of air currents, giving the lower chimney bad draft. In Fig. 4

FIG. 3. FIG. 4.

the heavy line shows form and size of chimney cap often used, and producing bad draft from restriction. The dotted line indicates the proper shape and size of cap for the chimney.

IMPROVED ELECTRICAL TESTING TANK.

In testing dynamos, a process lasting from 6 to 12 hours, the electrical power generated cannot be usefully employed but has to be dissipated by water or wire resistance. A tank of water is usually used, says a writer in the London Electrical Review. In the tank are two electrodes of large area, to which the positive and negative leads are attached; the electrolyte consists of a



IMPROVED TESTING TANK.

weak solution of either common salt or washing soda, the latter being frequently used, as the plates are not so liable to become furred. From Ohm's law we know that the amount of current which passes will depend inversely upon the resistance between the electrodes. The electric current in passing through the water (electrolyte) causes the water to become heated, but for testing purposes the water must be kept below the boiling point. To prevent boiling an English electrician has devised a tank in which a series of pipes are placed and through the pipes a current of cold water constantly circulates.

Another contributor to the same paper says "on no account use any salt, sodas or anything else to alter the density of the water." His plan is to allow cool water the flow into the tank and overflow.

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POPULAR MECHANICS

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WATER HEATERS USED 2,000 YEARS AGO.

Devices Employed by Ancient Romans Excelled Those of Modern Make in Many Respects.

The ancient Romans of 2,000 years ago fully understood and appreciated the principle of the water tube, the crowning feature of modern boilers, which was believed to surpass anything of the kind known to civilization. In two museums of Roman antiquities at Naples there are several water heaters, superior to many of modern make. One of them consists of an outer shell 12 inches in diameter and nearly 17 inches high, surmounted by a somewhat hemispherically shaped top. Inside this shell is an internal cylinder, also having a hemispherical top, which is ten inches in diameter and 12 inches high.

The two sheets are connected at the bottom by a rim, like the mud ring of a locomotive firebox, and the space between them was filled with water. The grate was formed of seven tubes made from sheet bronze, rolled and soldered or brazed. These tubes open at both ends into the bottom of the space between the sheets, thus forming a water tube grate for the fuel to rest upon. Charcoal was probably used with this heater and was placed on the grate through an opening 4.8 inches high and 4 inches wide, closed by a beautifully decorated door. The gases from the fire escaped into the outer air through three small openings formed by tubes crossing from the inner to the outer shell about 5.6 inches above the grate. The whole apparatus was raised about 12 inches on a tripod, so as to allow air to reach the fuel.

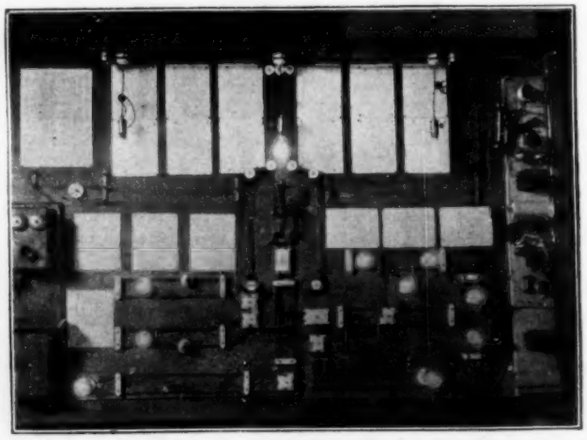
ELECTRIC CARS FOR HANDLING REFUSE.

Electric cars may be used in hauling away the city refuse of Brooklyn. A five-year contract is suggested at the rate of 30 cents a square yard. The present cost is 63½ cents. The net savings, besides the time, on the million cubic yards removed annually in Brooklyn will be $38,000. The amount of matter handled increases 20 per cent annually and hence the saving to the city during the five-year contract would amount to $282,780 in cash alone. A large amount of available dump land has already been obtained by the company and sites selected for thirteen stations. It is proposed to erect along the street car lines, double story buildings, in which the refuse will be handled automatically. The wagons would be driven into the buildings, hoisted to the second floor by an electric elevator and the contents dumped into the refuse cars. The latter, says the Street Railway Journal, would be hauled to the refuse grounds and dumped at night, when the regular traffic is at a minimum, and when there will be plenty of power capacity at the stations. It is estimated that the plant will cost more than half a million dollars.

PUPILS TAUGHT TO CONSTRUCT AND WIRE TELEPHONES.

Make Burglar Alarms and Show Great Prowess in All Kinds of Electrical Construction.

Students of the Bradley Polytechnic Institute, Peoria, Ill., in the course of electrical construction, have entire charge of the bell, telephone and other electrical apparatus of the institute. With a skill that is often amazing to older heads they construct and wire skeleton telephones, place and test motors and dynamos, and construct burglar alarms for doors, windows and safes. The class has wired two of the laboratories for drop incandescent lamps, and constructed all kinds of up-to-date electrical devices as a means of giving practical tests to the knowledge they have attained.



ELECTRIC LIGHT AND TELEPHONES.

The course in storage batteries includes: The study of various forms of storage cells and their uses, setting up, charge and discharge and efficiency test of a twenty cell battery. The bell and annunciator work includes: Installation of bell systems, fire alarms and thermostats, gas lighting and care of bell system of the institute. The electric lighting course consists of: Arc lighting, incandescent lighting, open and closed wiring, tree and closet systems. The telephone and telegraph classes are taught: The transmission of sound, study of standard receivers and transmitters, external and internal telegraph circuits, installation of plants and care of system in institute. Students of dynamos and motors design and construct, test and operate dynamos and motors. The accompanying illustration is to show the different methods employed by the pupils in wiring incandescent lamps. The telephone on the left hand side is an ordinary magneto wall instrument which is connected with the two skeleton 'phones on the right of the cut so that any one of the three stations may be called by either of the other two. Each student in this class is required to construct and wire one of these telephones.

The Bradley Polytechnic Institute is in affiliation with the University of Chicago.

The Illinois Central has ordered that passengers will no longer be permitted to remove their shoes in chair cars.

CATCHING FISH WITH KITES.

One of the Rarest of Sports—How the Apparatus Is Equipped.

Kite fishing is proving one of the finest sports of the day, in that it enables persons to catch great quantities of very large fish, hitherto almost impossible, with the hook and line. With the kite the fisherman is enabled to cast his bait far out at sea while he stands on short. The fish are thus not frightened by the sight of a fishing pole, rods or boats. The new discovery is attributed to Edward Horsman, the noted kite expert.

For this method of fishing a strong kite must be provided. The string carries a small pulley, through which the fish line runs. One end of the fish line, says Pearson's Magazine, is held by the fisherman on shore; the other, which is weighted, drops from the pulley as the ascent is made, and dips into the sea. At the moment when a fish snaps at the bait and is hooked, the fisherman feels the pull on his line, the kite is quickly hauled in and the fish is dragged in at the same time.

POSTAGE STAMP SOLD FOR $1,000.

The rarest postage stamp in the world was recently sold at public auction in London for $1,100. It is the Roumania-Moldavia 1854 issue, 81 paras blue on blue, unused, with nearly full gum and large margins.

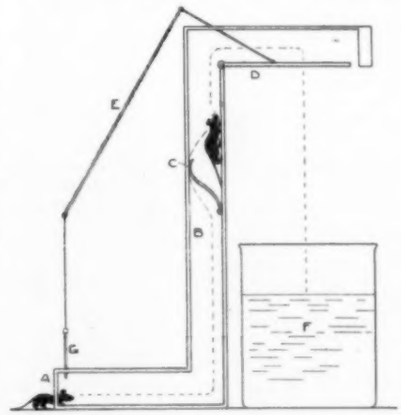
KIDS FOR KID GLOVES NEVER EAT GRASS.

Kids raised for the manufacture of the finest kid gloves are never allowed to eat grass. Such diet causes the skin to grow harder and coarser in texture. The mother's milk is about all that the small goat is allowed to eat.

The finest kid skins come from the animals grown on the mountain slopes of France. Skins of great excellence, however, are produced throughout the mountain ranges of Southern Europe. Such skins are used only in the manufacture of the finest gloves for ladies. The generality of so-called kid gloves are made from goatskin. Men's "kid" gloves are generally made from lamb skins, colt skins and calf skins.

INGENIOUS MOUSE AND RAT TRAP.

Otto Eggeling, of Chicago, keeps a large number of snakes in his terrarium and catches all the mice and rats necessary to feed them on by means of an ingenious trap he has devised. It is made of zinc and wood. It consists of an L-shaped upright, having an opening, A, through which the animals are lured by the smell of food. Naturally they run up B and depress a tongue, C, which quickly falls back in place after they have passed, preventing them from going back. They are then obliged to go farther on to a hinged platform, D, which gives way under the weight of the rodent, causing it to fall in the cage F. When the platform descends, D, it lifts the door, G, by means of the spring E, leaving the trap open for the next mouse to enter.



FIND A FOOT PRINT IN COAL.

A piece of coal bearing the imprint of a human foot is said to have been found by John Silinski, of Pittsburg, Pa. Several persons have testified as to the genuineness of the find. The lines are said to be clear and the print exceedingly distinct. This discovery tends to contradict the verdict of science that the earth was uninhabited during the coal age.

ARE OYSTERS FISH

The United States Supreme Court will be called on to decide the dispute between the authorities of Maryland and Virginia. When the boundaries of these states were determined Maryland was allowed the bed of the Potomac river, while Virginia was entitled to fish in its waters. Virginia fishermen take oysters from the river and the Maryland fishermen insist they have no right to anything on the bottom of the river.

Flowers will not live in a restaurant but thrive in a saloon.

TESLA'S WIRELESS TELEGRAPH STATION.

Long Island Plant Nearing Completion—To Begin Experiments Soon.

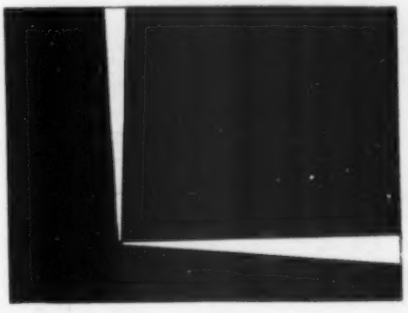
The wireless telegraph station being built for Tesla at Wardenclyffe, L. I., is nearing completion.

The power house, built of pressed brick and 100 feet square, is completed, and the big tower will be 100 feet in diameter at the base and 216 feet high. It will be 80 feet wide at the top. The materials used are wood and iron. Inside the tower will be a well 120 feet deep, with a staircase leading down into it. Transversely across the bottom of the well will be a series of four tunnels, each 100 feet long. These are being excavated now. The electrical equipment is nearly finished and Mr. Tesla, it is stated, expects to be ready to begin experiments in wireless telegraphy in the early spring.

HEADLIGHT PENETRATES THE SKY.

New Device on the St. Paul Which May Lessen Danger of Accidents.

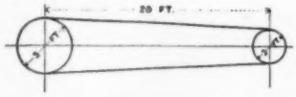
An electric headlight which it is thought will greatly lessen the danger of railroads has been satisfactorily tested on the Chicago, Milwaukee & St. Paul. The headlight not only illuminates the track for a mile ahead, but throws a beam of light which penetrates the sky 700 feet above the engine, and which may be seen ten miles away. This vertical beam is designed to afford a danger signal that may be visible to approaching trains on curves. It has been practically demonstrated, says the Railway Age, that the beam may be plainly seen, regardless of hills or intervening obstacles. Upon cloudy nights the reflection on the clouds has been seen many miles distant.



The simple acting steam turbine, directly connected to the dynamo, furnishes the current to operate a 6,000-candle power arc light. The vertical beam is made possible by the provision of an auxiliary deflector, which is arranged at an angle of 45 degrees on the outside of the face of the goggle, intercepting about 40 per cent of the light issuing from the parabolic reflector and projecting in the form of a vertical beam.

TO FIND THE LENGTH OF A BELT.

When pulleys are small or about the same diameters, add the diameters of the two pulleys together, divide the result by two, and multiply the quotient by three and one-seventh. Add the product to twice the distance between the centres of shafts, and you have the length required, says the Peerless Rubber Co. For illustration take the following example:

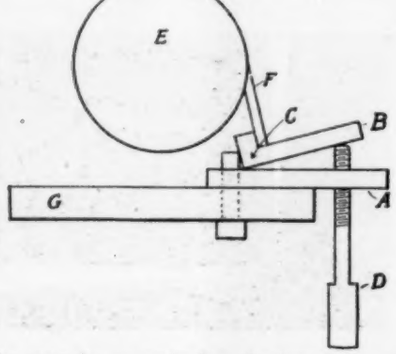


5 ft diam. one pulley	20 ft. dist. between centres.
3 " " "	2
2)8 sum of diameters	40 ft
4=½ sum.	12 57
3)	52 57 ft =
12.57 ft.	52 ft. 6⅞ in.—length of belt.

In putting on belting it should be stretched as tightly as possible; and with wide belts this can be done best by the use of clamps secured firmly to each end of the belt, and drawn together by clamp rods running parallel with and outside the edges of the belt. There is no danger of breaking, as a belt 6 inches wide and 3-ply thick will stand a direct strain of 5,000 pounds, and other sizes in proportion.

HINTS ON GRINDING MACHINE KNIVES.

While visiting a machine shop some time ago, I saw a pair of planer knives that had been ground on an automatic machine, and besides not being straight on the edge these knives were ground off 1-16 inch farther than was necessary, as could



be seen by an unbroken feather edge of that width. On 26-inch knives 1-16 inch is worth a dollar, in this case a dead loss, besides a charge of 25 cents for grinding, says Chas. Cloukey in the Wood-Worker.

The preliminary care is to see that the knives of each pair have the same measurements in the slots, and from the front of the slots to the back the whole length of the knife. When this is made sure it need not be repeated, and the main care thereafter is to keep knives the same width the whole length. When knives are put in this shape and ground to a uniform bevel, they should balance. From some things I have seen done, it might be well to add the caution to not grind the "heel" of the knife to get a balance. If there are low places or nicks to take out, file the edge down smooth and straight before grinding or if the knife is in very bad condition, grind first to thin it and then joint with file before finishing.

The accompanying drawing shows a good guide and rest for supporting knives while grinding. A is the cross piece that bolts to the stand; B is a slide or track hinged at C and tilted by wood screw or bolt D; E is wheel; F is knife, and G is stand table. This can be removed from the stand when not in use if so desired.

When knives are filed square across the edge, to joint them or take out gaps, it is not a difficult matter to grind them without burning, and by giving the knife a good steady swing back and forth, it is surprising how quickly a pair can be put in shape. I rarely spend more than 30 minutes on a pair of 24 or 26-inch knives, and they are often in bad shape to begin with.

In order to not clip or round the corners, come out at the end of the stroke at full speed and tilt knife away from the wheel, letting it down again as you start back. When you have determined your bevel, keep on grinding until the bright edge left by the file just vanishes; and this vanishing point is where you are liable to burn the edge or make it low in places unless you slow up for the finish. As the knife is ground on the upper edge as you hold it, there is no difficulty in watching its progress toward completion.

It also pays to keep the emery wheel in shape. I have a 12-inch wheel, 1½-inch face, that runs 1,000 revolutions per minute, and always keep it turned up and take it off when knives are ground, putting on another for ordinary work. It is always put on by corresponding marks on wheel and collar, and never hung up when taken off. The result of that is that it always runs "just like it was standing still." Emery wheels with lead bushings should never be hung up, as the jar of the machinery and the weight of the wheel will distort the lead and unbalance the wheel. The 12-inch wheel above mentioned, during the year just passed, did the grinding for four dozen knives—planer, jointer, sticker, etc.—and lost but ¼ inch of its diameter.

Pope Leo receives more mail than any other person in the world, the letters numbering 22,000 a day. His correspondence is read by 35 secretaries. King Edward receives 1,500 letters daily; Czar Nicholas, 600, and Emperor William, 700.

Mayor Jones of Toledo says begging is the divine right of men.

WIRELESS TELEGRAPHY FAILED.

It is reported from Honolulu that the company working the wireless telegraph system commercially in the islands has not proved a financial success. In such work as settting the clocks throughout the islands by chronometer from Honolulu the system proved a perfect success. But when it came to a question of important commercial messages the system could not be depended upon. The company had been doing business since May, 1900.

FARMER SOLVES THE TRAMP PROBLEM.

A New Jersey farmer has solved the tramp problem. It did no good to put up signs warning them off and keeping a bulldog at the gate, said the farmer. So I put signs for three miles around: "Tramps please call at the Baker farm," and "All Tramps Welcomed at Baker's." Just three called in a year. The last one after looking things over said:

"Any constables hidden in the barn?"

"Not one," I replied.

"How many bulldogs you got?"

"None at all."

"Got a lot of spring guns or bear traps set about the place?"

"Nothing of kind."

"Has a feller got to do a day's work to get a meal?"

"No work at all. You come right in, and I will give you a square meal for nothing, and if you want to stay all night I'll give you the best bed in the house."

He looked at me in a puzzled way for about a minute, continued the farmer, and then indulged in a wink and said:

"You can't play that little game on me, old man. This is my sixteenth year on the road."

"But what game?" I asked.

"Putting poison in the milk and selling our cavaders to a medical college for $5 apiece. Oh, no, Mr. Baker—not this eve!"

The belief prevails that a great underground river flows from the White Mountains in New Hampshire to the Narragansett Bay and is not more than 120 feet under the earth.

A snake having two heads and two tails was captured by Farmer Smith of Glenwood, Ia.

Caleb Johnson attempted to explore the mysteries of Dead Man's Cave at St. Genevieve, Mo., when he became lost and wandered for four days and nights in the darkness without food.

Kaiser Wilhelm has conferred with the Berlin chief of police with a view of beginning a war on all kinds of "faith healing."

SPIDER DISABLES FIRE ALARM SYS TEM.

That of Entire Town of Bayonne, N. J., Short-Circuited by an Insect.

The entire fire alarm system of Bayonne, N. J., was disabled by a single spider. The insect was found in the transmitter room, where all the wires converge into a network. Henry D. Kernaghan, who has charge of the alarm system, made the discovery. He said:

"Late at night one tap was struck. I got out of bed and went all over the five circuits, but failed to find the cause of the trouble. The system was plainly out of order," he said, in the Fireman's Herald, "and I was at a loss to know why. I finally turned my attention to the inside and found every indicator in the department in perfect running order. I went to the city hall and looked into the battery room. Tests proved everything O. K. there. I then went to the transmitter room and looked carefully over every part. To my astonishment the cause of all the trouble lay before me. It was nothing more nor less than a big, black, hairy spider. It was dead, and hanging to the wires in such a manner that its body 'short-circuited' the whole system. The blame thing had evidently mistaken the network of wires for a new sort of web, and was killed while doing a tight-wire act over it."

A NEW STORY OF SAWDUST.

From time immemorial sawdust has been used so widely and so exclusively for floors and circus rings that many people have come to the conclusion that it was never intended for any other purposes, says Judge. But now science comes to the front and opens the eyes of the world with an announcement that its true quality of greatness has been discovered, and that it will shortly become famous as the basic ingredient of a cattle food. People of ordinary habits of observation have noticed that cows find satisfaction and delight in banqueting on the foliage of boughs that swing within easy reach. And they have also made a note of the fact that horses find a unique joy in nibbling wooden posts. It will thus be clear to persons of subtle reasoning power that the cow in devouring the foliage exhibits a yearning for the sawdust of the tree quite as plainly as does the horse for his hitching post in a granulated form. Let us therefore trust that sawdust may improve the cow's milk and the horse's speed to such an extent that hay will be cultivated only for the department store tea trade. Let us also trust that the sawdust of the balsam may cure the beeve's tuberculosis, and that of the cottonwood improve the sheep's wool, while the horse-chestnut, reduced to pulp, may be to the racer what catnip is to the cat. Then the tree will be, so to speak, all wheat and no chaff, and will disclose nothing in the shape of waste, with the exception of the knot-holes.

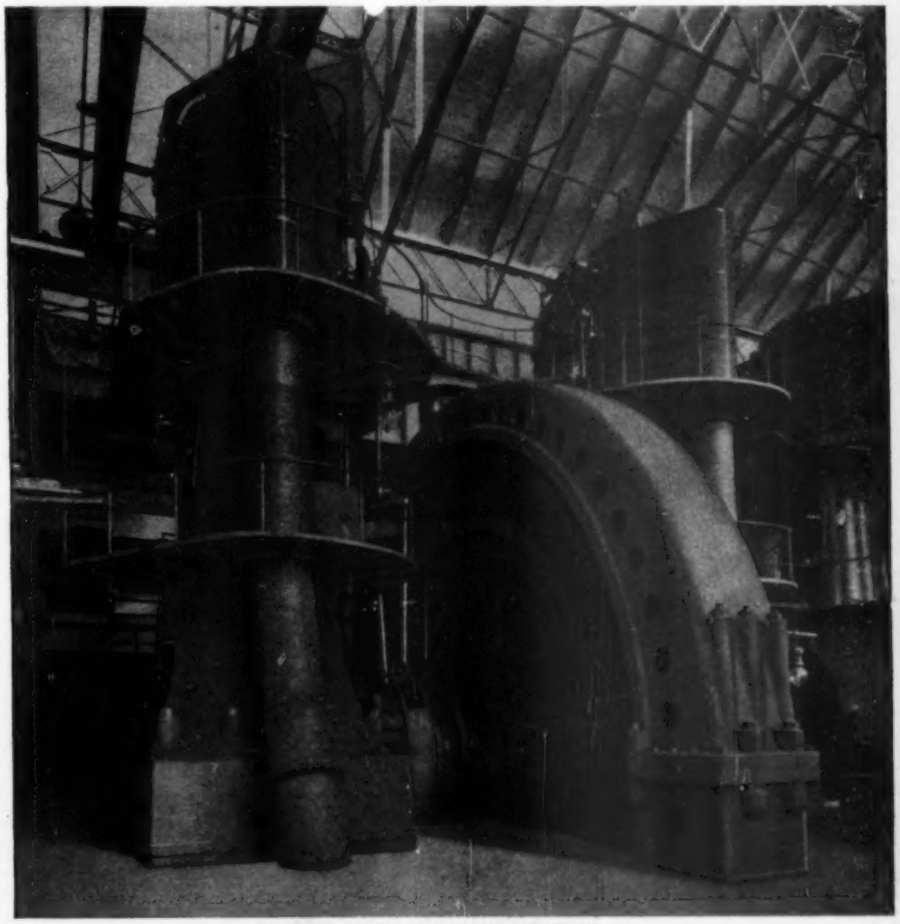
AUTOMOBILE AS A MAIL COLLECTOR.

The automobile as a mail collector is coming into prominence in several cities of the United States. In Chicago its practical utility and economy were fully demonstrated by Postmaster Coyne with limited facilities. As a result he has asked the department at Washington for equipment to conduct the automobile system on a much larger scale. Automobiles are now being used to collect mails at Minneapolis and are proving a decided improvement on the rickety cart and moping horse such as are employed in the service in most cities of the country. For some time Washington has used the automobile successfully as a mail collector. Other cities are petitioning the government postoffice authorities for the new service, as they claim there is no longer a doubt as to its practicability.

Thomas Estrada Palma, president of Cuba, said: "My father died when I was a boy and I was left entirely to the care and training of my mother."

A 10,000-HORSE POWER ENGINE.

The Manhattan Elevated Ry., New York, is completing an enormous power plant. Through the courtesy of the Street Railway Review we illustrate one of the engine units in that station. These engines of which there are eight, are each of 10,000 horse power, direct connected to electric generators. The revolving part of the generator is 32 feet in diameter and weighs 370,000 pounds. It is mounted on a hollow steel shaft weighing 63,000 pounds. This shaft is from 30 to 37 inches in diameter and was forged in a hydraulic press exerting 15,000 horse power. Each engine is 45 feet high above the floor. If all the engines were operated at their fullest possible limit they would together exert nearly 100,000 horse-power.



GENERATING SET—MANHATTAN RY.

Representative Lever of South Carolina is the youngest member of the lower house of Congress, being but 27 years old.

What seems to be needed is a world's fair syndicate, which would pull off an exposition for a stipulated sum. This would save expense and worry and any city could have one on any scale of magnificence.—Tribune.

THE LARGEST DROP FORGE WRENCH.

Weighs 150 Pounds and Has an Opening of 7 5-8 Inches.

The largest drop forge wrench in the world has just been turned out by J. H. Williams & Co., Brooklyn, N. Y. The wrench weighs 150 pounds; is 59 inches long and has an opening of 7⅝ inches, which is capable of grasping a nut of a 5-inch bolt. The wrench is master of a line of 15-degree-angle-design tools, first

created by Mr. Williams, 17 years ago. The new tool will be welcomed by builders of mammoth engines, and such huge machinery, as a wrench for nuts of engine foundation bolts, bearing boxes and sections of fly wheels and traction wheels. The dies in which the wrench was forged weigh more than 1,300 pounds. In contrast to this monster wrench the firm makes one of the same design which weighs but ⅛ ounce, and is probably the smallest wrench in existence.

AN ELECTRICAL HISTORY.

The Electrical Review, New York, on Feb. 15 celebrated its twentieth anniversary with a special number which traces the history of electrical development for two decades. As most of the electrical history of the world has been made during this time the issue is not only valuable, but full of interest.

The Marconi theory has been successfully used in surgery in New York. The doctor avoided the use of anaesthetics by short-circuiting a nerve, thus preventing sensations from reaching the brain.

BOY CONSTRUCTS A TELEPHONE SYSTEM.

Gordon Simmons, 15 years old, of Muncie, Ind., has won the enmity of the telephone company by constructing a private telephone system of his own, and permitting people to talk over it for nothing. He has a partner, Mark Smith, one year his senior. By giving bonds they have been permitted to string wires across streets and alleys and they have already connected three other residences with their own. Simmons' system is that in which but one wire is used, thus he makes mother earth do half of the work. The positive current is transmitted by the wire and the negative by the ground by means of short wires running from the telephone instrument into the ground, where they are attached to tall stakes. The sound of the voice transmitted over this telephone is as distinct as that transmitted over the conventional telephone line.

Young Simmons makes all of his own batteries, motors and dynamos. He is now perfecting a dynamo and motor to be used in operating an electric fan. The boy is the son of J. L. Simmons, a blacksmith.

LESSONS ON USING OIL FOR FUEL.

How to Obtain Perfect Combustion Which is Necessary for Maximum Amount of Heat.

To produce a maximum amount of heat from oil it is necessary to have perfect combustion. It is necessary that the elements of fuel and the elements of air be thoroughly mixed with each other. If one has a greater density than the other, says the Age of Steel, the heavier will force its way into the body of the lighter and while it may be entirely surrounded by the lighter elements, it still may remain an intact and separate body. If two elements of unequal density are propelled into a space with equal force the one having the greater density and specific weight will have the greater velocity, and if it is propelled into this space with a greater force than the one with the lighter density its velocity will be correspondingly increased. If the velocity is very strong the heavy element, or part of it, will be carried through the lighter and pass beyond it without mingling.

A spray of oil having a heavy density, with a sufficient degree of velocity, can be propelled through a body of air having a lesser density, and even though the air is heated to the temperature of combustion, or is a mass of flames, a portion of this oil will pass through without being burned.

The density of an element is due to the amount of its substance, and when this substance is expanded by the absorption of heat it decreases in density and increases in volume and pressure. One cubic foot of oil containing 6.2 gallons, weighing 7¾ pounds per gallon, equals 48.05 pounds of oil.

The theoretical amount of air required to burn one pound of oil is 15 pounds. One pound of air contains 13.2 cubic feet. Multiplied by 15, the lowest number of pounds of air that will furnish the necessary oxygen to burn one pound of oil, equals 198 cubic feet of air required to burn one pound of oil. One hundred and ninety-eight multiplied by 48, the number of pounds of oil per cubic foot, equals 9,504 cubic feet of air to burn one cubic foot of oil. At this ratio, oil must be expanded to 9,500 times its normal size before it is of an equal density as that of the lowest amount of air actually required. And as the amount of air admitted is generally greater than what is actually used, this estimate is conservative. By feeding oil in a spray mixed with steam, the weight of the two is greater than that of the two alone, as by the action of heat, steam is changed to oxygen and hydrogen which can be utilized in the process of combustion.

I do not know of a better illustration of this method of trying to burn oil than by saying it is like throwing a number of large lumps of coal into a furnace and admitting blasts of air, and expecting perfect combustion because there is a supply of both coal and air.

To get satisfactory results it is necessary to break up the coil and divide the air, so that the necessary mingling can be made. With oil a similar method must be used.

WHO WILL INVENT AN ENGINEER FOR THE 150-MILE FLYER?

"We can build engine that will run 150 miles an hour," says Cleveland Moffit in St. Nicholas, "but where will we find the men to drive them? Already we have nearly reached the limit of what the eyes and nerves will endure. I think we will have to find a new race of men to handle the locomotives of the future, that they talk so much about.

"So great is the nerve strain and brain strain upon the men who drive our ordinary fliers that three hours at a stretch is as much as the stanchest engineer can endure, running at 50 or 60 miles an hour. The fast mail and express service between New York and Chicago requires relays of 14 engines and 14 engineers and 14 firemen for a single round trip of a single train. And many times it appears when an engineer has faced the rush of one of these terrible fliers to the end of his relay, say 150 miles, you will see him climb down from the cab weak and unstrung. It is only the flower of the company's engineer that can stand the strain at all."

HOW TO BREAK OFF A SOLID PULLEY FROM ITS SHAFT.

Frequently a solid pulley becomes so rusted to its shaft, that its removal is a matter of great difficulty. Chas. Herman, writing in Power, tells how to remove the pulley when ordinary means fail, and with less time and labor than by using a cold chisel and hammer. He says:

As it will simplify the explanation considerably, I shall take the pulley in Fig. 1 (6 inches length of hub, 2 inches bore, 4½ inches diameter, making the hub 2½ inches thick), and break it, theoretically, on its shaft.

Into its hub, down to the shaft, drill ½ inch clearing holes in a straight line (one hole to every 1½ inches of hub length), diametrically opposite the weakest part of the hub, i. e., the part fitted with the set screws or key, as shown in Fig. 2.

These holes may be drilled by the use of a ratchet and a shafting drill post, after breaking off the pulley face and arms; or by wedging in the ratchet between the hub and pulley rim, as shown in Fig. 3; or by improvising a shafting drill post, where the pulley is too small for wedging in the ratchet and no regular shafting post is to be had, as in Fig. 4. Clamps AA being tightened up, hold the drill post securely without injury to the shaft.

Having drilled the requisite holes, put a pin wedge, Fig. 5, into each hole. The pulley rim being broken away, so that you can get a square blow at them, proceed to drive them home. Keep all the pins moving together, that is, tap or hit each in succession. Doing this divides up the wedge function between them and enables you to split the hub without undue exertion by the use of a machine hammer, or, at the most, a small hand sledge.

The pins should be round and tapering and so proportioned that ⅛ inch for 2½ inches thickness of hub to ¼ inch for 3½ to 4 inches thickness of hub shall be the most above the size of the drilled holes that the pin shall taper. They should be tempered to a peacock blue. If hit squarely when in use they can be used for an indefinite number of jobs; but if hit side and glancing blows they will snap off on account of temper. The pulley hub cracks under above treatment, slowly but surely, giving ample time to look out and prepare for the final break.

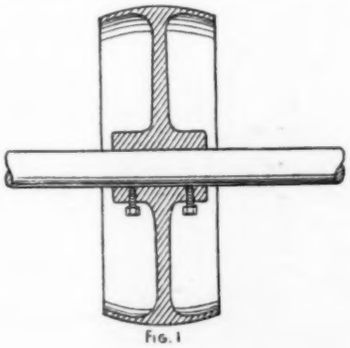


Fig. 1

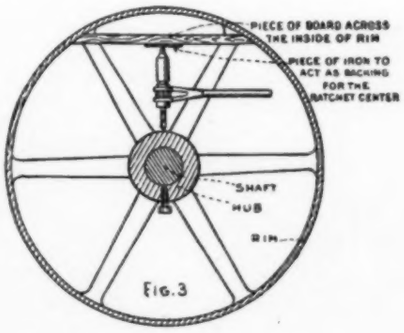


Fig. 3

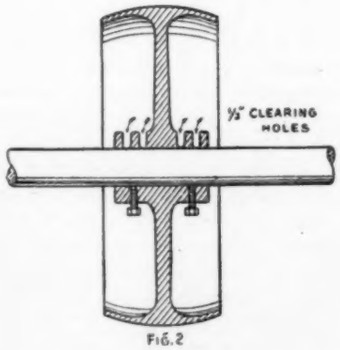


Fig. 2

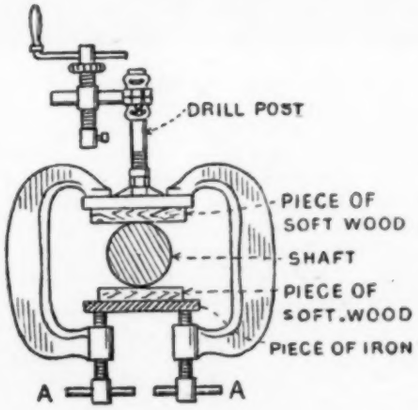


Fig. 4.

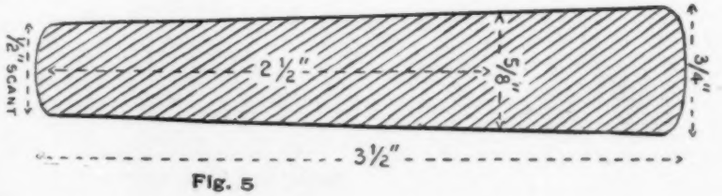


Fig. 5

TALL TREE TO TRAVEL.

An effort is to be made to remove a large red oak tree from the wildest section of Arkansas to Forest park, St. Louis, for the coming World's Fair. The tree is 160 feet high and 12 feet diameter at the base. A double tramway will be built from the tree to the river, where it will be floated and towed to St. Louis. It is estimated that this will occupy six months. The tree will be dug up by the roots instead of being cut down, and none of the branches will be trimmed.

T RAIL MADE IN WALES IN 1830.

The banquet given in honor of Andrew Carnegie on the occasion of the dedication of the Carnegie Laboratory of the Institute of Technology at Hoboken, N. J., was replete with novelties. Among the treasures on the table, says the Hotel World, was a T-rail made in Wales in 1830, and kept in a silver casket, with all the documents pertaining to its history. A blast furnace, four feet high, on being tapped, yielded punch. When the counterweighted door of the open hearth was raised fried oysters were the manufactured product. A Bessemer converter, after a "blow," yielded cakes, and a railroad, 40 feet long, with cars and ladles, brought railroad spikes and other material to each guest, the ice cream coming along in the shape of T-rails.

NIGHT SIGNALS FOR INTERURBAN CARS.

New System Installed in Mansfield, O., Proves Successful.

A new and effective system of signaling interurban cars at night is being put in service in Mansfield, O. Mr. Arthur J. Haycox, who describes the system in the Street Railway Review, says the lamps are attached to poles, a convenient distance above the ground, five lamps in a series. A person desiring to board the approaching car only has to move a lever, which turns on the light.

"The lamps are inclosed in a neat iron box," says Mr. Haycox, "and are fed from the trolley. The ground wire is brought down the pole in a gas pipe into another small contact box, which is supplied with a neat lever. All the passenger has to do is hold down the lever. The amount of current consumed is not more than one-half ampere for one-fourth minute."

The Shah of Persia has the finest collection of cats in the world.

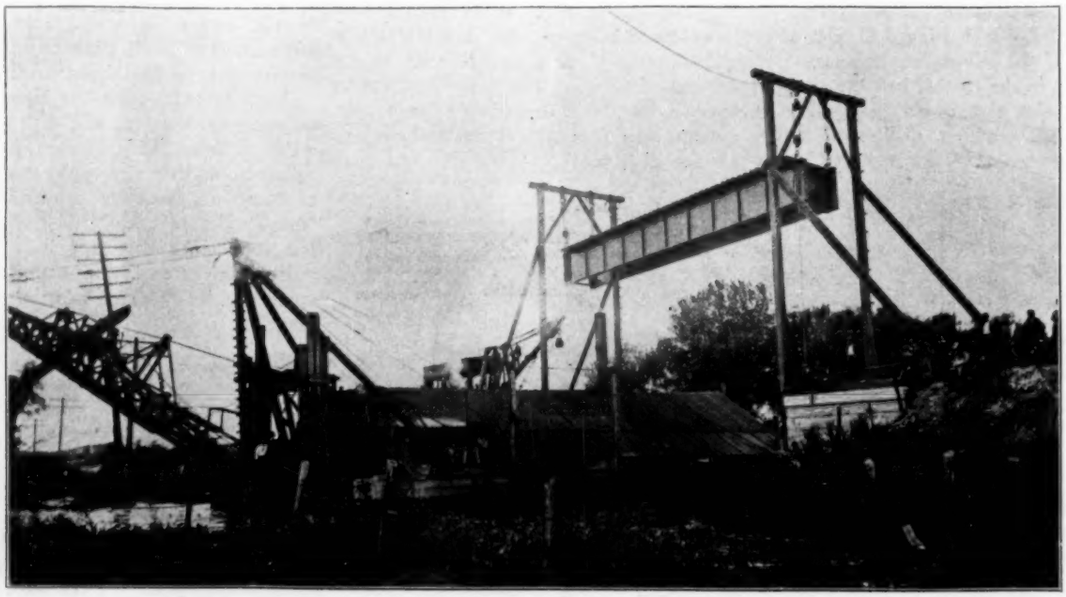
The adoption of automatic couplers for freight cars, which are now required by law, resulted the past (first) year in a reduction in fatalities of 35 per cent, and decreased injuries by 52 per cent.

LIFT BRIDGE TO LET DREDGES PASS.

Model of Convenience Put in Service by the Illinois Central.

To avoid the usual worry and delay of permitting a dredge to cross a railroad right of way, the Illinois Central has devised a lifting bridge which has proven a model of convenience. Where some dredging work was in progress on the Illinois Central main line, two miles south of Paxton, Ill., the bridge, with ties and track, was raised bodily 40 feet, to clear the mast of the dredge which stood 33 feet above the water. The dredge was 48 feet of beam and 85 feet long, says the Railway Review, and was passed through the tracks clear of everything in 42 minutes.

In the construction of the lift bridge use was made of two bents of 12x12-inch timbers, 50 feet long, braced and capped, as shown, to which two sets of double blocks, reafed with 1½ inch line, were attached. One bent was set up on each abutment. This tackle was then made fast to the 60-foot deck girder bridge, weighing 104,795 pounds, the lead lines being carried to the engines of two derrick cars, one of which was set at each end of the bridge.



TEMPORARY LIFT BRIDGE.

SWIMMING BY MACHINERY.

A recent invention consists of a float to be filled with air and fastened to the breast with straps. A small rope passes through a winding device on the float, and is worked by the alternate movement of the legs, the ends of the rope being fastened to the feet. When the rope is moved through the winder it causes a small propeller to revolve and assists the swimmer forward.

TELEPHONES IN STREET CARS.

Invention That Enables Carmen or Passengers to Talk by Wire While Car is Running.

Telephones in street cars are to result from the invention of a Toledo, Ohio, man, according to the claims of the inventor. C. F. Bidwell, who gave a demonstration of the new device at Muskegon, Mich., says that it was invented by his father. The new system makes it possible for persons on an electric car going at full speed to talk to persons seated in other cars on the same line, running in any direction at any distance. It is also possible for passengers in a moving car to talk with persons at stations or in residences anywhere within the local exchange.

The overhead trolley is used for one side of the circuit and for the other a second wire is strung parallel with the stationary trolley. To the metal trolley pole of the car is attached a second pole which operates on the second wire by means of a flanged wheel. A close circuit is thus obtained. Telephone wires leading into the car are attached to the trolley poles.

Jones: "My son was out bicycle riding the other day when he fell, and tore out the west side of his trousers."

Smith (after a lengthy pause): "The what?"

Jones: "The west side of his trousers."

Smith (after another lengthy pause): "Well in the name of Beelzebub, which side is the west side of his trousers?"

"Why, the side the 'son sets on'."

Fifty years ago Henrik Ibsen was a clerk in a drug store.

MANUAL TRAINING AIDS THE BRAIN.

Hand and Mind Should Be Educated Together for Harmonious Results.

Manual training by means of the hands, says the New York Times, provides the brain with enough sensuous observations to carry on the development of the different brain centers in a perfectly harmonious manner. The result is a powerful brain. A teacher says that the training of the hand, so as to make it automatic and therefore of service in a trade, has little influence on the brain, but much upon the muscles. Automatic hand or muscle movements neither require nor cause extensive brain activity. The brain must have material to work on. These materials cannot be supplied except through the senses —sensuous observation through all manner of manual activity. The hand acts as a sort of drag net for the brain, provides it with innumerable sensuous observations, and these make the basis of an education. Man differs from the lower animals in that he uses his feet for locomotion and his hands for other things. Keeping the hands idle while the brain is active with the alphabet has a strong tendency to strengthen the memory at the expense of the judgment centers of this wonderful piece of mechanism.

The president of one of the largest medical colleges in the world said recently, "If I had a boy who was to be a surgeon the first step I would take would be to give him a manual training school education. I would train his hands to do things accurately and deftly."

Germany's crown prince is an excellent pianist and sings well.

Our free booklet, "Are Your Hands Tied?" tells you how to do it. Thousands have largely increased their salaries by following our plan.
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162 Washington Street, - Chicago

Mention Popular Mechanics.

FOR THE MADAM.

SAYS THE DAISY MUST GO.

Because he says the daisy is unfit for cow fodder and a bad thing to have in the wheat fields, Representative Leggett, of New York has drawn up and introduced a bill into the legislature of that state asking that the daintiest of flowers be exterminated.

All over the country people who consider sentiment above the commercial value of cow-fodder are demanding that the bill be defeated. "If the daisy must go," says one paper, "let every maiden in our land rise up and demand an explanation. Without the daisy the old game of "he loves me, he loves me not" would have to be abandoned and that alone would be deplorable. How can we have either love or poetry daisy-less?" What would the sweet singers do? What is love, what is life without the daisy?"

WHITE FRUITS AND FLOWERS FOR HAT TRIMMING.

"Spring hats will be perfect flower beds," says the Chicago Dry Goods Reporter. "White foliage and white fruits and flowers will lead in the ornamentation. While cherries and leaves of their natural color, and white strawberries and currants with foliage in white, very faintly streaked with green, are among the latest creations. Then there is white violets, white violet leaves and all kinds of flowers and fruits and foliage in white. In many cases foliage alone will constitute the garniture. Long reeds of grass is another novelty. They surround the whole brim of the hat, are loosely twisted and caught at intervals by a knot of narrow black velvet. Here the crown is concealed beneath a cluster of water lilies or field flowers. Corn and oats are arranged in the same manner, with poppies or daisies on the crown.

KISSES THAT HAVE BEEN FATAL.

Kisses have caused the death of thousands. In 1794 the Duchess of Gordon raised the famous Gordon Highlanders by giving a thousand recruits a kiss and a golden guinea apiece. In its first battle with the French 250 were killed and wounded. Prince Ferdinand of Bavaria, while visiting a neighboring state, kissed the beautiful Princess Thyra. Her betrothed witnessed the incident. Hot words, blows, a duel and a war followed, resulting in the death of thousands. A Spanish sailor stole from his vessel, quarantined and flying a yellow flag because of pestilence on board, sought out his sweetheart in Candalo, Fla., and kissed her. The girl succumbed to the plague which spread through the town and 200 persons out of a total population of 1,500 died as a result of that one kiss. These are only a few instances of kisses that have been fatal.

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The total number of German Americans in the United States is estimated at about 15,000,000, or one-fourth of the population.

Alfonso XIII of Spain will not be crowned. The ceremony of the coronation of kings does not exist in Spain.

Sally H. Bunnell, a Mormon of Provo, Utah, has 219 living descendants,—11 children, 73 grandchildren, 135 great-grandchildren and four great-great-grandchildren.

The inhuman method of catching live rabbits by means of baited fish-hooks is being practiced in Maine to such an extent that it is considered a new industry of that state.

"Want" and "For Sale" Ads. 10 cents per line payable in advance. Replies may be sent to a number, care Popular Mechanics, and will be forwarded promptly without extra charge.

SPECIAL.

FOR SALE—One 1-1 H. P. motor. One 1-8 H. P. dynamo. Photos for stamp. Roy A. Crihfield, Lincoln, Ill.

ENGINEER'S LICENSE—Mechanics, Engineers, firemen, electricians, etc., 40 page pamphlet containing questions asked by Examing Board of Engineers; sent free. Geo. A. Zeller, Publisher, Room 592, 18 S. 4th St., St. Louis, Mo.

FOR SALE—Job lot new electrical goods given us to sell; list for stamp. We handle everything electrical and at lowest prices. Stamp for catalogue. Dept. N., T. Binford Electric Works, 904 Washington Blvd., Chicago, Ill.

BUSINESS CHANCES.

FOR SALE OR EXCHANGE—122 acres all plow land in McHenry county; well fenced; good well and windmill; price $50 per acre. Address 400, Popular Mechanics.

FOR SALE—Locomobile runabout, nearly new, $400. Address 402 Popular Mechanics.

FOR SALE—Steam auto truck; cost $5,000; will sell for $300. 354 Dayton street, Chicago, Ill.

FOR SALE—My stock of harness and saddley; also the lot and building; located in one of the best towns in eastern Nebraska. Poor health cause of selling. W. R. Christman, Hooper, Dodge county, Nebraska.

WANTED—To buy machinery now in use; one 250-volt Dynamo of 1,500 to 1,800 light capacity with motor balancer; moderate speed four-valve engine and boiler of about 125 H. P. Grimes Bros., Electric Light & Phone Co., Great Bend, Kan.

INFORMATION WANTED—Subscriber has a small machine shop he is anxious to establish in a small thriving town; is a first-class machinist and draughtsman, also expert bicycle maker and fine gunsmith. Suggestions of a favorable locality acknowledged with thanks and postage paid. W. E. Piper, 343 E. 43rd St., Chicago.

WANTED—500 Volt Motors, from two to fifteen horse power. Rose Electric Co., St. Louis, Mo.

FOR SALE—One full set of tinners' tools (except squaring shears) and one pipe cutting and threading outfit, ⅜ to 2 inches. Charles Keil, Sherburne, Minn.

WANTED—Second hand Wire and Straightening Machine with cutter; state best cash price; and must be in good condition. The Arras Cream Separator Co., Bluffton, O.

OWING TO ILL HEALTH must seek other climate; $10,000 will buy a complete old established wholesale electrical and mechanical specialty business; $2,000 net annual income. C. S. Du Mont, 47 Jewett Bldg., Buffalo, N. Y.

WANTED—Second hand 30-inch squaring shear; must be in good condition and cheap. C. G. Schlegel, Kenesaw, Neb.

FOR SALE—My hardware and harness business; small town and small expense; stock invoiced $2,000 in January, and building and lots must go with it at $1,100. C. F. Troeller, Larrabee, Ia.

WANTED—8-foot Robinson or Keene cornice brake. Geo. E. Roesch, Aurora, Ill.

WANTED—A first-class electrotype molder or finisher; wages $18 for 54 hours. Crane & Co., Topeka, Kas.

HELP WANTED.

DRAFTSMAN—ARCHITECTURAL—FIRST-class, references required. Address Frank L. Packard, Architect, Columbus, O.

15 FIRST CLASS STOVE MOUNTERS to work on gas ranges. Abendroth Bros., Port Chester, N. Y.

Attractions for Next Week.

Have you got a Camera? If so you want a flash lamp. Why not make one for yourself. Popular Mechanics next week will tell you how.

Thousands of birds fly so high up that they can't be seen. A Chicagoan has devised a scheme of coaxing them down and making them light in Lake Michigan. A seven-masted schooner, the largest sailing vessel in the world, is nearing completion. Some fishes live under water, at such a depth that they are born blind; these and deep water sharks often injure telegraph cables. Whole cities are imperiled by infected rats; read about how ships may be cleared of rats; read about a man who found a great fortune in an old musical instrument he bought for nearly nothing; a Kentucky legislator who is also a barber; about street cars as houses; the proposed air ship races, and about how jumping off and on cars causes serious nervous diseases. These are not half of the interesting things told about next week. Everybody wants to know about them; everybody wants to read Popular Mecanics—written briefly, written well, "written so you can understand it."

BRASS FINISHER—Experienced; one who can bend pipe and assemble showers and sanitary brass work; good wages. Bailey-Farrell Mfg. Co., Pittsburg, Pa.

WOOD PATTERN MAKER—First class; experienced in stone work. A. J. Lindemann & Hoverson Co., Milwaukee, Wis.

ELECTROTYPE MOLDER—Experienced in molding and building up all kinds of work. Address with references, The Smith-Brooks Ptg. Co., Denver, Colo.

MACHINE HANDS—Wood; first-class, steady work, good wages, stock cutter preferred. Original Mfg. Co., Evanston, Ill.

ALL AROUND TINSMITH—One that understands plumbing, steam heating and pump work. J. P. Brownell, Riverside, R. I.

DRAPERY CUTTER AND FIREMAN—Experienced, to take charge of drapery sewing room. The Brooks Household Art Co., 636 Prospect St., Cleveland, O.

FOUNDRY FOREMAN—An up-to-date foundry foreman, who understands floor, bench, and squeezer work, for light gray iron castings. Address Foundry Foreman, Room 708 New York Life Building, Chicago, Ill.

PHARMACIST—Correspondence with an all around young pharmacist, to travel some and work in laboratory. Address Box 8, Mount Vernon, Ill.

STOVE PATTERN MAKERS—First-class; good wages and a steady position. The Richmond Pattern Works, Richmond, Va.

AN EXPERIENCED FOREMAN—For established tin shop, making cans only. Address Tinner, 312 The Cuyahoga, Cleveland, Ohio.

AGENTS—Ladies to sell perfumes and toilet articles. 313, 167 Dearborn St., Chicago.

RULER—Who can forward; steady work. Address, stating wages expected, Brandt Printing & Binding Co., Manitowoc, Wis.

TAILORS—Two or three good coatmakers; good wages and steady work. Moore & Garstang, Waterloo, Ia.

Popular Mechanics

GOOD TO READ
GOOD TO THINK ABOUT
GOOD TO TALK ABOUT

POSITIONS WANTED.

MINING ENGINEER—Scientific and practical training; six years' experience; mine and surface surveying, assaying; accurate draughtsman. Address Engineer, 428 Yamhill street, Portland, Ore.

WANTED—Position by sober general hand in Texas, Oklahoma and Indian Territory; 10 years' experience in hardware and harness business combined. Can make good Texas saddles. W. T. Church, Box 145, Hico, Texas.

SALESMAN with experience and acquaintance with hardware, house furnishing and department store trades wants position. "C. E." 70 Kilby street, Boston, Mass.

SHEET METAL WORKER and general jobber at inside and outside work; 20 years' experience; steady position in country desired. Chas. Willis, 428 West Eighteenth street, New York.

FOREMAN, CUTTER or BENCH WORKER in cornice and skylight shop; in or outside work; German; first-class worker. Adolph Klein, 403 East Eleventh street, New York.

METAL MINE MANAGER AND SUPERINtendent—Twenty years Western and Mexican experience; good assayer; mill and cyanide man. P. O. Box 99, Steeple Rock, N. M.

PLUMBER, first-class, wishes work in city or country; wages moderate. W. Kelly, 307 East Sixtieth street, New York.

TINSMITH, first-class, having twelve years' experience in cornice and furnace work, also able to estimate on all styles of work; country town in Central States preferred. "P. A. C.," care Columbian Novelty Company, 921 Franklin avenue, St. Louis, Mo.

WANTED—By practical iron molder, a situation as foreman; many years' experience in heater and stove plate work; also in bath tubs, laboratory and sinks. Edward H. Green, 618 N. Bond St., Baltimore, Md.

ASSAYER AND CHEMIST—A graduate of the Colorado School of Mines, with eight years' constant practice at ore-sampling and chlorination plants in Colorado. C. M. P., Salt Lake City, Utah.

CUBA—I will locate in Havana this year and want a general representation for machinery, tools and hardware specialties; well acquainted with languages and customs; references; bond if necessary. C. S. Lawrence, Box 814, New Orleans, La.

UNDERTAKER—Young single man of five years' experience in the furniture and undertaking business. Will furnish any state license. Address Fred L. Griswold, Delton, Mich.